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Original Article

The Carbofix™ "Piccolo Proximal femur nail": A new perspective for treating proximal femur lesion. A technique report

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ABSTRACT

Metastases to proximal femur are common and surgery is often suggested to prevent fractures; otherwise it is necessary in cases where this has already occurred. Adjuvant radiotherapy is necessary to reduce the risk of local progression. Nevertheless, the success or failure of radiation therapy treatments depends upon the accuracy in which target identification is correct and dose prescription is fulfilled. Unfortunately, the use of titanium nails consistently limits radiation dose; indeed, the presence of ferromagnetic artifacts interferes with target identification.

We present the technique for implant a new carbon fiber nail useful to reduce the ferromagnetic artifacts which allows a better adjuvant radiotherapy.

1. Introduction

Proximal femur is one of the most common sites of metastasis secondary to the spine and pelvis.[1]

Within the proximal femur about half of the lesions are located in the neck, 20% in the pertrochanteric region and 30% in the subtrochanteric region.[2] These types of lesions often compromise quality of life due to consistent and severe pain endured which can subsequently evolve into pathological fractures.

Even though the main approach used toward patients with metastatic disease is systemic therapy, surgery is often suggested to prevent fractures, particularly in cases where this has already occurred.[3]

When the proximal femur is the only site of metastasis, wide resection and prosthesis replacement are the most reasonable choices, regardless whether the primitive histotype is favorable.[4]

Intramedullary nailing treatment is indicated in patients with multiple metastases, in the following conditions: when prognosis is considered unfavorable, when it is important to avoid constraining the patient to the bed, permitting weight bearing and preventing local and general complications.

This surgery is intralesional and has just a biomechanical aim; it does not decrease the tumor mass, otherwise the associated bleeding and growth factors release could increase its progression. Thus adjuvant radiotherapy is vital in reducing the risk of local progression making previous surgery useless and in reducing the risk of nail breakage otherwise happening with consistent probability.[5]

Unfortunately, the use of titanium nails in the canal and femoral neck leads artifacts during radiation imaging and therapy. The presence of a high-Z material in an irradiated patient results in reducing radiation through the inhomogeneity as well as local perturbations known as interface effects. Thus, imaging results are affected by ferromagnetic artifacts and dose calculation is rendered inaccurate.[6] The success or failure of radiation therapy treatments depends upon the accuracy in which target identification is correct and dose prescription is fulfilled. The presence of cold spot of the prescription dose could result in under-treating the disease with major risk of progression. In addition, there will obviously be significant benefits also in defining the state of the disease detectable in CT imaging follow-up of treated patients.

Carbon fiber nails are characterized by a low artifacts level so that radiotherapists can administer a more effective dose with less risks for the patient.[7,8] Unfortunately, until now, its use was limited by the absence of the nailing system with cephalic screw. To the best of our knowledge, this is the first nail which allows neck screws. The technique here presented emphasizes the use of radiopaque markers.

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2. Methods

The technique is similar to traditional nailing; nevertheless, some differences have to be taken into account. Because of its radiolucency, it would not have been possible to see the nail during the insertion if radiopaque markers had not been present in its structure. Under X-ray intensifier control, it is possible to identify the nail proximal end, the lag screw–nail interface marker, the longitudinal marker and the distal hole marker.

The patient is placed in the supine position onto a fracture table, the affected limb is stretched out with dedicated support; traction is necessary in case a pathological fracture is present or there is an increased of it occurring during surgery. The contralateral hip is flexed and abducted.

After setting the operative field, an 8 cm incision is performed in the lateral hip, about 5 cm proximally to the apex of the great trochanter. After splitting fascia lata longitudinally, a sharp cannulated intruder is used to open the medullary canal

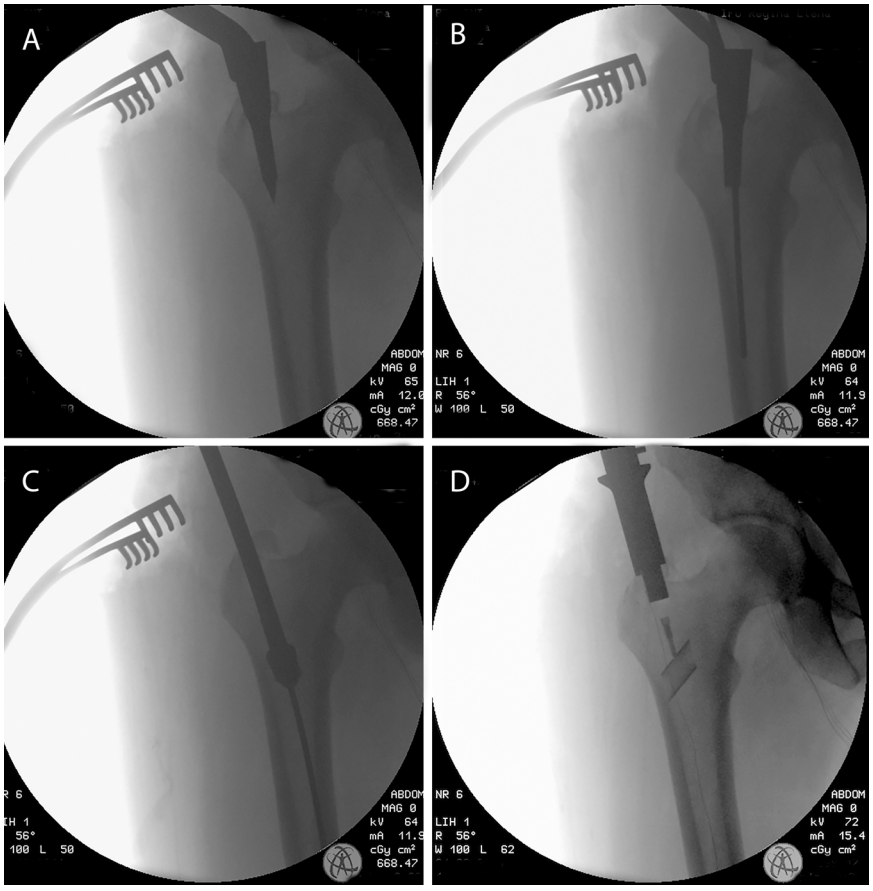

Fig. 1. Intraoperative X-ray intensifier imaging showing the medullary canal opening (A), the K-wire inserted as guide inside after stylet removal (B), the canal reaming (C) and the nail being inserted inside the canal until the lag-screw marker is in right position (D).

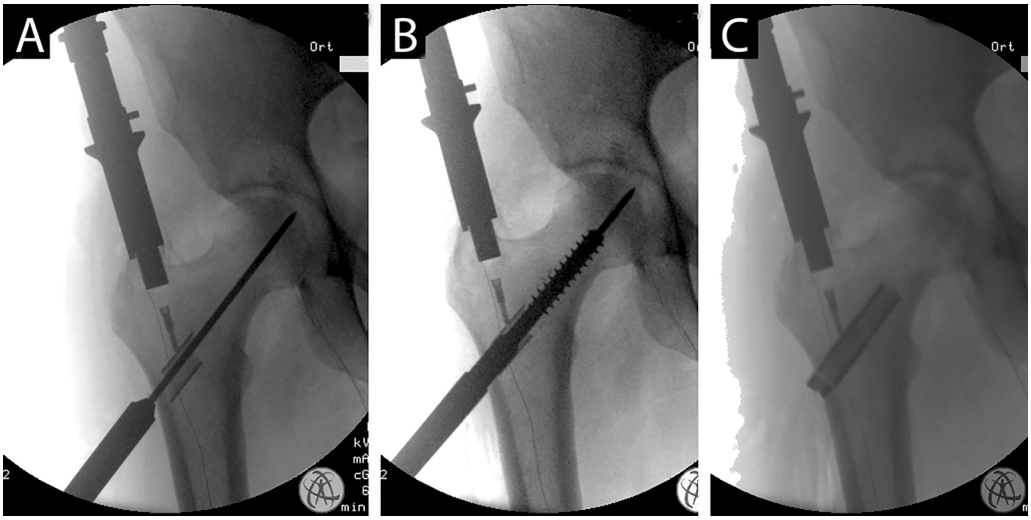

Fig. 2. Intraoperative X-ray intensifier imaging showing the K-wire insertion along the femoral neck (A), the successive reaming (b) and the nail positioned at the right level with the cephalic lag-screw inserted and visible just in the proximal part (C).